REMARKS

Applicants respectfully request reconsideration of the subject application as amended herein, and request that the present after final amendment be entered. This Amendment is submitted in response to the Final Office Action mailed on August 5, 2009. Claims 8-38 are rejected. In this Amendment, claims 8, 18, 33 and 35 have been amended. No claims have been added. Claims 23-32 have been canceled. Therefore, claims 8-22 and 24-38 are presented for examination.

Summary of Examiner Interviews

Applicants thank the Examiner for granting Examiner Interviews on November 24, 2009 and December 8, 2009. In the Examiner Interviews, one of the inventors of the present application, Gopinath Kuduvali, explained differences between the limitations of the independent claims (claims 8, 18 and 33) and the cited art. The applicants and the Examiner reached an agreement that will place the application in condition for allowance. The present amendments to the claims reflect the agreement reached by the Examiner and the applicants.

Rejections Under 35 U.S.C. § 103

Claims 8-38 are rejected under 35 U.S.C. § 103(a) as being unpatentable over Grzeszczuk et al. (U.S. Patent No. 6,782,287 B2, hereafter "Grzeszczuk") in view of Murphy et al., (U.S. Patent No. 6,125,164, hereinafter "Murphy") and in view of Bifulco et al. (Estimation of OOP vertebra rotations..., hereinafter "Bifulco").

Grzeszczuk teaches registering a CT scan (3D scan) with a pair of 2D x-ray images (fluoroscopic images) in 6 degrees of freedom (DOF). (Grzeszczuk, col. 7, lines 5-7). However, as stated in the present Office Action, where 6 DOF registrations are required, Grzeszczuk generates perturbations of digitally reconstructed radiographs (DRRs) that

correspond to all 6 degrees of freedom. Therefore, Grzeszczuk fails to teach or suggest registering reconstructed images that correspond to perturbations from an initial position along fewer than 6 DOF with x-ray images by computing a set of 3D transformation parameters that represent a change in position of a target along up to six degrees of freedom.

The current Office Action cites Murphy and Bifulco as teaching systems that can perform image registration along 6 DOF using DRRs that correspond to perturbations along fewer than 6 DOF. Murphy and Bifulco both teach systems that can perform image registration along up to 6 DOF. However, when Murphy and Bifulco perform image registration along 6 DOF, both Murphy and Bifulco require that DRRs correspond to perturbations along all 6 DOF. Neither Murphy nor Bifulco teach or suggest using a set of DRRs that is generated using perturbations along fewer than 6 DOF to perform image registration along up to 6 DOF.

To further clarify the distinction between claim 1 and the combination of Grzeszczuk, Murphy and Bifulco, claim 1 was amended to recite, "registering said reconstructed images that correspond to perturbations from the initial position along fewer than six degrees of freedom with said x-ray images by computing a set of 3D transformation parameters that represent the change in position of said target between said initial position of said 3D scan and said current position of said x-ray images along six degrees of freedom." Similarly, claim 18 has been amended to recite, "registering said reconstructed images that correspond to perturbations from the initial position along fewer than six degrees of freedom with said x-ray images by computing a set of 3D transformation parameters that represent the change in position of said target between said initial position of said 3D scan and said current position of said x-ray images along six degrees of freedom." Additionally, claim 33 has been amended to recite, "registering the first x-ray image with the first set of 2D images by computing a first set of up to five transformation parameters that represent at most a first five

degrees of freedom; registering the second x-ray image with the second set of 2D images by computing a second set of up to five transformation parameters that represent at most a second five degrees of freedom; and combining the first set of transformation parameters and the second set of transformation parameters to obtain a combined set of six 3D transformation parameters that represents a change between the initial position and the current position of the target, wherein the combined set of six 3D transformation parameters represent six degrees of freedom."

Applicants respectfully submit that as amended, claims 8, 18 and 33, and their corresponding dependent claims, are patentable over the combination of Grzeszczuk, Murphy and Bifulco. Accordingly, applicants respectfully request that the rejection to these claims under 35 U.S.C. § 103(a) be withdrawn.

Conclusion

Applicants respectfully request the withdrawal of the rejections and submit that pending claims 8-22 and 24-38 are allowable. Applicants respectfully request reconsideration of the application.

If the Examiner determines the prompt allowance of these claims could be facilitated by a telephone conference, the Examiner is invited to contact Benjamin Kimes at (408) 720-8300.

Deposit Account Authorization

Authorization is hereby given to charge our Deposit Account No. 02-2666 for any charges that may be due. Furthermore, if an extension is required, then Applicants hereby request such extension.

Respectfully submitted,

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